

Railroad Accidents, Their Causes and Remedy

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Before the value of any remedial measure can be determined for railroad accidents, and their resulting casualties, the principal causes of accidents must be ascertained.

The Interstate Commerce and many of the state commissions have for sometime past conducted investigations, resulting in a large amount of information, from which reliable deductions may be drawn concerning the causes of railroad accidents. Accident bulletins of the Interstate Commerce Commission, Nos. 42 and 43, are the latest issues available, and cover the six months period between October, 1911 and March, 1912, inclusive. The conditions described are, generally speaking, typical. It is found that 7,249 train accidents occurred on the interstate steam railroads in the United States during that period, resulting in 447 deaths and 8,383 injuries to persons.

ACCIDENTS CAN BE CLASSIFIED.

It is apparent from a study of the causes to which these mishaps are attributed, they may first be classified under two heads, to-wit: Preventable and Non-preventable.

PREVENTABLE ACCIDENTS.

Under this head, should be placed all accidents caused by collisions, spread rails, soft track, bad ties, irregular track and negligence of employees. The responsibility for them can be directly placed; they are attributable to carelessness, human fallibility, false economy or failure to provide safe means on the part of the companies. Thus in each case, some duty has been neglected because of which the casualty occurred.

NON-PREVENTABLE ACCIDENTS.

Non-preventable accidents are those caused by latent defects of equipment, broken rails, unforeseen and malicious obstructions on track, etc., the responsibility for which cannot be directly placed.

RAILROAD ACCIDENTS ON INTERSTATE STEAM RAILWAYS IN THE UNITED STATES.

October, 1911 to March, 1912, inclusive.

Tables are herewith given listing the above mentioned accidents, classified as stated, and from which it is found:

PREVENTABLE ACCIDENTS.

CAUSES	NUMBER	PERSONS	
		KILLED	INJURED
Collisions.....	3,100	267	4,804
Spread rails	145	4	167
Soft track	188	3	93
Bad ties	30	0	17
Irregular track	258	6	327
Miscellaneous roadway defects.....	168	8	204
Negligence of employes.....	214	7	224
TOTALS.....	4,103	295	5,836

NON-PREVENTABLE ACCIDENTS.

CAUSES	NUMBER	PERSONS	
		KILLED	INJURED
Defects of equipment.....	1,981	38	698
Broken rails	277	22	768
Unforeseen obstructions on track.....	214	35	273
Malicious obstructions on track.....	33	6	127
Miscellaneous	639	50	665
Sun kink	2	1	16
TOTALS.....	3,146	152	2,547
GRAND TOTALS	7,249	447	8,383

RESPONSIBILITY OF PREVENTABLE ACCIDENTS.

Under the above mentioned classifications, it is shown that preventable accidents are responsible for

4,103 or 56.6 per cent of all the mishaps,
 295 or 66.0 per cent of all the deaths,
 5,836 or 69.6 per cent of all the injuries,
 6,131 or 69.4 per cent of all the casualties.

COLLISIONS.

Collisions alone of all the preventable accidents are found to be responsible for

3,100 or 75.5 per cent of the preventable accidents, and 42.7 per cent of all accidents;

267 or 90.5 per cent of the deaths from preventable accidents and 59.7 per cent of deaths from all accidents,

4,804 or 82.3 per cent of the injuries from preventable accidents and 57.3 per cent of injuries from all accidents.

5,071 or 82.7 per cent of the casualties from preventable accidents and 57.4 per cent of casualties from all accidents.

COLLISIONS HAVE FEATURED DURING 1912.

Collisions, in particular, have featured in railroad casualties during the past year and early relief therefrom must be secured to the public which is demanding the safe service to which it is justly entitled. If this single cause can be eliminated, an important step will have been taken toward making railroad travel safer.

COLLISIONS ARE INEXCUSABLE.

Of all classes of railroad accidents, collisions appear to be the least excusable. From a study of the rules, regulations and other safeguards thrown around operation of trains by the companies, it is impossible to foresee how a collision could occur if strict compliance therewith be rigidly observed, but they do occur with appalling frequency, and are the direct cause of a majority of the casualties.

CAUSE OF COLLISIONS.

It is difficult to see any value in a rule which is not enforced; if, therefore, we find that each collision resulted from a failure by someone to observe a rule made to prevent such an occurrence, our problem is simplified to finding some means for the establishment and enforcement of proper rules, for there is no industry in existence more dependent upon the human element for its safe operation than is a railway. In none of the ordinary walks of life, generally, are employes so well compensated for their services. Their hours of labor and rest have also been regulated by legislation to their advantage. They may and should be held to a high degree of efficiency.

RESPONSIBILITY FOR NON-OBSERVANCE OF RULES DISPUTED.

There is apparently a sharp division of opinion on this score between the managers and general officers who formulate the rules and the employes who are required to obey them, and it is a familiar claim that employes are at times expected to violate written rules, and if the required operations are to be conducted within the time allowed such violations are unavoidable. This

is denied by the officers who claim that observance of the rules, though earnestly desired by them, is impossible of enforcement, because of the negligence of their employes, and that the fault for such violations is chargeable to the individual employe.

STATE SHOULD ASSERT ITS AUTHORITY.

Without attempting to say which of these contentions is true or whether the truth lies between them, the mere fact that the rules are violated and that each class asserts their observance, is prevented by the activities of the other class, demonstrates the necessity that the state, more powerful than either, and representing the public, must in some manner assert its authority and secure both the establishment and the observance of proper methods of operation.

STEEL CARS vs. WOODEN CARS.

In our effort to eliminate the causes of collisions, we should confine ourselves strictly to questions which are pertinent to the problem. In my judgment, the wreck-resisting qualities of steel and wooden cars should not enter into consideration, because to anticipate the continuation of this lamentable feature of railroad operation, with a view toward the construction of wreck-proof cars and equipment, would be equivalent to a suggestion to the public that they should not expect to obtain satisfactory relief from preventable railroad accidents.

AUTOMATIC CONTROL OF TRAINS.

Automatic mechanical devices for controlling train operation have been suggested as being the only possible means for checkmating collisions on the railways in this country.

The necessity for automatic control of trains is not established until we have exhausted all means for prevention of errors in train operation now at our command. Some justification will then exist for seeking other fields for a remedy.

The fact that European managers do not consider such mechanical means essential for safe operation of trains should induce us to exercise caution in recommending measures of this character for adoption.

It might be preferable to emulate the methods of our foreign neighbors, whose enviable record of comparative freedom from preventable accidents in railroad operation, has attracted wide comment and approval, even in our own country.

AUTOMATIC TRAIN CONTROL SECONDARY TO SIGNAL SYSTEMS.

The automatic train control device, if its utility could be established, would at the very best be only an auxiliary to and of secondary importance to the signal systems, and past experiences have proven that practices, not es-

sential to the safe operation of trains are, as a general rule, not given the careful attention that the primary measures receive.

AUTOMATIC TRAIN CONTROL vs. AUTOMATIC COUPLER.

Notwithstanding that the inventive genius of man has not yet been able to devise an automatic train control device that will work with absolute precision under all climatic and other conditions arising in train operation, arguments have been advanced to the effect that legislation should be enacted making the adoption of such means compulsory on the part of the railway companies within a limited period of time; the point in view being that such action would tend to spur the railway companies into hastening the perfection of such means. Legislation resulting in the adoption of the automatic coupler and other safety appliances, pertaining to cars and locomotives, is cited as an example of what may be accomplished in this direction by the passage of such laws. However, this legislation, requiring the railway companies to adopt the automatic coupler, was not made effective until many years after the device had been perfected.

Its practicability, absolute reliability and worth had been established beyond a question of doubt by severe service tests in actual railroad practice, and it had already been adopted by many of the leading railway companies in this country. In this regard, there is positively no similarity between the two propositions. The elimination of the old type link and pin coupler—for the automatic type, presented an entirely different problem from the removal of the human equation from train operation. The former concerned the employe's safety while in the act of performing his prescribed duties, while the problem in hand contemplates largely the passengers' safety from the employe's failure or error in performing his prescribed duties.

DANGER IN AUTOMATIC CONTROL OF TRAINS.

Except perhaps in a very few conceivable special cases, it is a question whether grave danger does not lurk in the introduction of a mechanical means that tends to make an automaton of a railway employe. This device is likely to make the employe careless of the responsibilities which he has assumed. It may cause him to feel that he is a mere supernumerary who has been practically relieved of responsibility in the handling and control of the train, vigilance over track, signals, flags, and in fact will, to a certain extent, encourage the omission of many of the duties and requirements so essential and necessary to insure the maximum of safety in train operation.

AUTOMATIC TRAIN CONTROL WILL SHIFT RESPONSIBILITY.

The automatic train control device might shift the responsibility of safe train operation from the high grade and long experienced engineman or train operator to the less experienced maintainer of mechanical devices. The successful working of any piece of mechanism is solely dependent at all times on the hand and mind creating it, so it must need follow if the human agency fails, either directly as in the first instance or indirectly as in the second case, a calamity would result.

MECHANICAL PRECISION vs. HUMAN PRECISION.

Even if we were to realize the ideal automatic mechanical control of trains, it would still be extremely doubtful if such beneficial results could be obtained from the automaton as would be possible from the best efforts of the human agency, because it has been well demonstrated in the past that the skill of the human hand is capable of producing results which the most accurate machinery cannot accomplish. No system of mechanical safeguards can be devised that will dispense entirely with human responsibility. Man's genius, with all its vast accomplishments in mechanical perfection, has not yet succeeded in developing the "fool proof" machine, but in every operation there appears at some point the dominating influence of the human mind. Let it relax or waver for an instant and all mechanical perfection is at naught.

AMERICAN RAILWAYS SUPERIOR IN MECHANICAL EQUIPMENT.

No railways are better equipped with mechanical devices for safeguarding human life than are the railways of this country. Cars and locomotives of the most modern construction equipped with air brakes of the most efficient design, are in general use. Highly perfected automatic signal systems, designed to preclude the possibility of collision, are in use on many lines. Their use is being extended, although not so rapidly as might be. Yet, with all these mechanical measures, lives are snuffed out by the score, because some man failed to perform his duty. With all our perfection in this direction, it begins to appear as though we are encouraging carelessness among employes through over-confidence in mechanical perfection.

INVESTIGATIONS OF COLLISIONS.

A notable feature in practically every report of collisions is the recital that one or several employes failed to do something which they should have done, and if they had obeyed the rules of the company, the collision and

resulting casualties would not have occurred. In this regard, there is a marked contrast in sensibility to duty and appreciation of responsibility to society between the railway employes of this country and those of European railways. Whenever the European railway employe fails in performing his prescribed duty in train operation, and his failure of duty results in death or injury to persons, he is held accountable to the state, and it is an interesting fact that there are even less fatalities in connection with the operation of railways in Germany than with that of the agricultural pursuits of that country.

AMERICAN EMPLOYEE vs. EUROPEAN EMPLOYEE.

It is doing the American employe an injustice to contend that he is inferior, mentally and physically, to his European brother and, therefore, that it is necessary to devise mechanical means to perform the services to which society is entitled and which the employe is in duty obligated to render. If it is possible for the European railway manager, the American manufacturer, businessman, contractor, and the government, to obtain absolute reliability and precision from their employes, it ought not to be impossible for the American railway companies to get the same attention to duty and precision from their employes.

RAILWAY EMPLOYEES SHOULD BE SENSIBLE OF THEIR DEBT TO SOCIETY.

The railway employe should understand that a railway is a quasi-public corporation and that when he accepts employment with it, he becomes a quasi-public servant and owes the same duty and responsibility to society as the company that employs him.

REMEDY SHOULD BE DEvised FOR FALLIBILITY IN RAILWAY EMPLOYEES.

Since the foregoing statistics show that human fallibility is responsible for 59.7 per cent of the deaths and 57.4 per cent of the casualties resulting from all accidents for the period under consideration, it is apparent that serious investigation must be made to find an effective remedy. This is especially true since it has been demonstrated that it is not impossible to obtain reliability and precision from such employes in other countries and from employes in other industries of this country.

RELATIONS BETWEEN RAILWAY MANAGERS AND EMPLOYEES.

There should be closer working relations between the managers and employes of railways for the purpose of encouraging open and free discussion on the subject of safety. The problem of making men trustworthy and dependable, if approached in the right direction, will not be found the hopeless task it is often assumed to be. Some of the railway companies have already formed "safety committees," with this very object in view. Their slogan is "safety first." They co-operate with all the employes in devising measures of safety for the protection of life and limb in all branches of railway operation. Methods of this kind should be extended and encouraged.

RAILWAY EMPLOYEES OF ALL GRADES SHOULD BE AMENABLE TO STATE.

Much has been accomplished by Germany and other European countries in checkmating preventable accidents in railroad operation by making railroad employes amenable to the state for negligence in the performance of their duties. Thus far, however, when effective disciplinary measures have been suggested as a deterrent to carelessness in operation, the difference in the sociological and political conditions existing here and in European countries has been cited as an insurmountable obstacle to such methods. Even though a majority of the European countries are in advance of us on this question, a start has only been made in the direction of eliminating the human equation from railroad operation. The American people, the most efficient on earth, could accomplish much in this same direction if they but tried. A new idea cannot be perfected without some experiment, and until an honest attempt is made to find out how far the methods in vogue in the European countries may be relied upon in this country, it will not be known to what extent sociological and political conditions enter as factors into this problem.

THE RAILWAY EMPLOYEES' INTEREST IN CORRECTIVE MEASURES.

The operation of railway trains is fast developing into an important and superior vocation, and all right-minded employes are beginning to realize the necessity of the introduction of effective means to protect them personally from the dangers attendant on the negligent acts of incompetent, careless or indifferent employes. It is conducive to their own interests and safety to encourage and advance such projects.

REMEDY FOR FALLIBILITY IN RAILWAY EMPLOYES.

To accomplish this purpose, it may be necessary for the state to go beyond the corporate entity and its executive officers and hold each individual employe responsible for the proper and safe performance of his individual duty. This may be brought about in many different ways, and it is suggested that it may be effected in the following manner:

Employes engaged in train operation should be required by law to serve an apprenticeship of a sufficient duration to qualify themselves for the position they seek. Before the applicant is permitted to serve in any capacity in train service, he should be examined by a competent state board of examiners as to his physical and mental qualifications. Such examinations and tests should be graduated so as to meet the requirements of the different grades of the service, and a license should define the kind of service the applicant may perform. The state to reserve the right to revoke the license for good cause, which should be renewed only upon satisfactory showing.

Most of the states have legislation of this character as to physicians, lawyers, dentists, undertakers, electricians, horseshoers, plumbers, stationary enginemen, barbers and others, for no other purpose than to protect society, and it is needless to add that excellent results have been secured. As far as the public is concerned it is difficult to understand how the ability and requirements of the horseshoers, barbers or plumbers, are of greater importance to society than that of railway employes, and if it is possible to reduce indiscretions and incompetency in the classes mentioned by effective legislation, it should not be difficult to extend similar legislation to railway officials, managers and employes with corresponding benefit.

STATE LAWS BEARING ON OMISSIONS OF DUTY.

Some of the states of the Union now have laws upon their statute books making the omission of duty of railway employes a misdemeanor.

The Minnesota law reads as follows:

"5002. *Other Violations of Duty.* Every engineer, conductor, brakeman, switch-tender, train dispatcher, or any other officer, agent or servant of any railway company, who shall be guilty of any wilful violation or omission as such officer, agent or servant, by which human life or safety shall be endangered, for which no punishment is specially prescribed, shall be guilty of a misdemeanor." (6638.)

The Minnesota law, however, makes it incumbent upon the county in which the accident occurred, to prosecute. Very often the counties do not prosecute, and it may be desirable to have these laws broadened so as to make

it obligatory upon the state through the attorney general to aid when advisable in the prosecution of any omissions of duty whereby persons are either killed or injured.

DEFECTIVE ROADWAY.

The foregoing table also shows that 789 of the preventable accidents were caused by defective track, resulting in 21 deaths and 808 injuries to persons. Insignificant, you might properly say, compared with the casualties resulting from collisions; however, they would not have occurred if the railway companies had provided a safe roadway for the operation of their trains. The fact that 14 per cent of the casualties from preventable accidents are due to this very cause, is of sufficient moment to merit earnest consideration, and it is suggested that careful thought be given the matter of requiring state supervision of all railway roadways, including track, ties, switches, bridges, etc.

BROKEN RAILS.

The table also shows that broken rails were the source of 277 of the non-preventable accidents, causing 22 deaths and 768 injuries to persons, or a total of 790 casualties. Compared with the 4,103 preventable accidents which caused 295 deaths and 5,836 injuries to persons, or a total of 6,131 casualties, it demonstrates beyond question that rail failures are not the main agent of railway disasters, as the public has been led to believe.

EFFORTS TOWARD ATTAINMENT OF IDEAL RAIL.

There is probably no topic associated with railroads that has been or is at the present time being subjected to such thorough study, experiment and research, as is that of railroad rails. Several eminent bodies, composed of the ablest engineers and metallurgists in this country, have been for sometime past and are still conducting experiments and tests for the purpose of getting the ideal rail, and their efforts have been marked by considerable progress.

INVESTIGATIONS OF RAIL FAILURES.

Many investigations have been made of rail failures. It is not claimed that rails break from their own inherent shortcomings, and it does not seem that rails which have safely stood shipment from the mills, handling and placing into track, should fail from their own innate weakness.

These examinations indicate that breakages occur in rails constituted of good as well as poor quality metal. The failures are largely caused by

unusual strains which are induced by severe and abnormal service conditions to which rails are subjected, in which may be included shocks from broken or flat wheels, defective counterbalances, wheels out of round, defective track, improper fastening of rails upon ties and other like circumstances that would tend to produce such strains. Approximately 55 per cent of rails broken may be classified as being of good metal; the remaining 45 per cent consists of comparatively poor quality metal.

By term "poor quality" is meant rails proving themselves defective after having been subjected to service and cover such defects as segregation of constituents, unsoundness, brittleness, faulty rolling, including pipe, old seam, flow of metal, split head, crushed head, split web, broken base and other short-comings, many of which defects it would be impossible to discover at the mill.

RAIL FAILURES DURING COLD WEATHER.

These examinations also show that the largest number of rail failures occur during winter months, and especially during periods of extremely cold weather. This being the case, it appears railroad travel might perhaps be rendered safer if the speed of heavy passenger trains was restricted within moderate limits during at least the era of extreme temperatures.

AMERICAN RAILS vs. EUROPEAN RAILS.

While rail breakages are practically unknown on European railways, the foreign rails are not by any means superior to American rails; however, the European roadbed, as a general rule, is far superior to the American roadbed, because it is much better built and drained. The rails are screwed in well-preserved ties and these are bedded with utmost care to secure that permanent evenness and smoothness of surface that is so essential for adequate and proper support for the rails and the loads.

WHEEL LOADS ON RAILROAD RAILS.

In England, the greatest allowable or safe weight per driving wheel to be borne by rail for the Atlantic (4-4-2) and American (4-4-0) types of locomotives is 22,400 pounds; for the Pacific (4-6-2) and Prairie (2-6-2) types, 19,000 pounds.

On the state railways of Germany and Italy, the allowable or safe weight per driving wheel is 18,150 pounds. Tests and experiences of these foreign railways were their guides in determining the safe limits of wheel pressures.

In the United States the average wheel load has increased from about 22,000 pounds in 1885 to 28,000 pounds in 1907, although many driving wheels carry more than 29,000 pounds, and some of the Atlantic type (4-4-2) carry over 30,000 pounds per driving wheel; the loading just given, viz., 28,000 pounds, represents probably as nearly as may be the average driver loading of American locomotives, such as are used on main stem railways.

During the same period the weight of rail in main track has increased from about 65 to 75 pounds per yard to 85 and 100 pounds per yard, which heavier weights now generally predominate.

The very marked contrast just cited, between the wheel loading on rails in Europe and in this country, indicates that the effect of the wheel load on rail might be a very profitable topic for further consideration and study.

The Interstate Commerce Commission in its report of the accident on the Lehigh Valley Railroad, near Manchester, N. Y., August 25, 1911, states:

"These examinations * * * should take up the securing of measurements in the track of the actual fibre stresses which are caused by the new types and weights of locomotives and under the different wheels of these locomotives in order to obtain information from which to judge of the severity of the strains to which the track is daily subjected; in fact, track conditions as they exist at the present time, should be dealt with even to the most minute detail."

RAILS MUST BE PROPERLY SUPPORTED.

It is well recognized that rails must be properly supported and held in place, i. e., the ties supporting the rails must be of sufficient size and number to safely carry the loading intended, they must be so firmly and substantially bedded as to prevent rails from being submitted to any abnormal strains by deflections induced by passing wheels.

That this point is important is demonstrated from a study of the causes of broken rails from which it is found a great many breakages have occurred right at or near places where tie renewals had just been made. Old bed is often disturbed more or less in putting in new ties and not sufficient attention is given in all cases to tamping and bedding new ties which omission results in an irregularity in the surface of the bed of the rail, so that enough shock is induced by the passing wheel to cause the rail to break.

RAILS MUST NOT BE MISTREATED.

Rails are of a molecular structure and should not be unnecessarily submitted to blows from hammers, track mauls or otherwise. Such practices should especially be avoided in cold weather.

RELIEF FROM BROKEN RAILS PROMISED.

If the effective work now being done by those engaged in the preparation of the ideal rail was augmented by a similar effective educational work treating with the proper care of rails and roadbed among the track forces of the railway companies, the prospects for the elimination of rail failures would indeed be bright, and this end may be accomplished by co-operation with the forces preparing the new standard specifications for rails.

DEFECTS OF EQUIPMENT.

It is also noted from the table that defects of equipment caused 1,981 or about 63 per cent of all the non-preventable accidents. They were the source of 38 deaths and 698 injuries to persons; sixteen more deaths occurred from this source than from broken rails. This class of accidents leads by far all the classified causes under the heading "Non-preventable Accidents," and as it is well known, defective equipment frequently causes broken rails. It appears this feature of our railroad practice also merits serious consideration and study. It is suggested that measures be devised for a more thorough and efficient system of inspection of all equipment. These methods of inspection should be so thorough that it would prevent any but good order cars and locomotives being placed in trains.

ERRORS IN RAILROAD OPERATION.

When effective remedies have been devised and introduced for correcting the several foregoing defects in our railway operations, viz., collisions, defective track, broken rails and defective equipment, relief will have been obtained from 87.7 per cent of all railroad accidents; 79.4 per cent of all deaths and 87.1 per cent of all injuries to persons resulting from such accidents, and when these ends have been accomplished, it will then be time enough to devise means for the elimination of the remaining 12.3 per cent of the non-preventable accidents that have not then removed themselves by sympathetic contact with the effective application.

AUTOMATIC BLOCK SIGNALS.

Wonderful progress has been made in the development and perfection of the automatic block signal, a device designed to safeguard the movements of trains. The efficiency and reliability of this method of signal protection can probably best be illustrated by reference to the experience gained from such installation by one of our western railways. The company referred to has 454 of these signals in use; they afford protection to 100 miles of single track roadway and to 331 miles of double track roadway.

During the year 1911, these signals performed 8,426,990 movements in actual service, out of which number only five false clear indications resulted, and as these false indications were immediately discovered by those in charge of their maintenance, the safe movements of trains were not affected by the failures. One of the failures was caused by defective lubrication of mechanism; the other four were attributed to faulty construction. This is, indeed,

a very remarkable showing and emphasizes in the strongest terms that the possibility of obtaining a false clear signal indication from the present perfected system of signaling, is very remote.

That most gratifying results are obtainable from the use of automatic block signals, properly designed and installed, is demonstrable from the experience of all who have used them in train operation, because their use reduces to a certain extent the opportunities for the human agency to err, and as their use also affords adequate protection to train movements, they are of inestimable value in safeguarding these movements.

Many miles of the improved type of automatic block signals have been installed and placed in use by the railways in this country for no other reasons than that of availing themselves of the advantages obtainable by the adoption of such means for safeguarding and expediting train movements.

No question now remains but that the public's interest in the safe operation of trains would be materially furthered and safeguarded if the introduction of the modern efficient automatic block signal systems was required to be extended to include all lines of railways where the prevailing traffic conditions could be materially improved thereby. These extensions should also include all lines that are now handling important traffic with inadequate, obsolete or antiquated signaling devices.

INTERLOCKING PLANTS.

There are probably no safety devices of greater importance to the public welfare in railroad operation than those protecting and safeguarding train movements over railroad crossings and through junction points at grade, and over draw bridges. While it is true that the various states have in the past interested themselves very effectively in seeing to it that ample protection was afforded from errors in train operation at these points, traffic conditions have changed so materially during the past decade that, as a general proposition, the states' efforts in this direction have not kept pace with the changed operating methods.

In this connection it is extremely desirable and to the mutual benefit of both the public and the railway companies, if the rules and regulations affecting the construction and maintenance of these safety devices, be uniform in the essential features. These rules and regulations when finally prepared must be flexible enough so as to be workable and practical under all varying operating conditions, and it appears that this end can best be accomplished by the co-operation of those who are familiar with the operating conditions existing in the various parts of the country.

With this object in view, the railway commissions of the states of Indiana, Illinois, Wisconsin and Minnesota, through their engineers and signal experts, have been at work for the past eighteen months in the preparation of a uniform system of rules and regulations for the construction, operation and maintenance of interlocking plants. The last conference was held in the office of the Minnesota Railroad and Warehouse Commission, in St. Paul, on September 27, 1912. The work is now so far advanced that it will be submitted to the four above named commissions for approval at an early date.

LAWS AFFECTING RAILWAY OPERATION.

Laws regulating the number of men constituting train crews, or the experience these men must have before they may enter the train service, have been enacted in 21 states of the Union.

Laws regulating the number of hours of service of the employes engaged in train service have been enacted in 25 states and by the Federal Government.

Laws regulating the kind of cabooses to be used in train operations have been enacted in 16 of the states.

Laws regulating the kind of headlights to be used on locomotives have been enacted in 14 states.

Locomotive boiler inspection legislation has been enacted in 7 of the states and also by the Federal Government.

Ostensibly the purpose of these and other laws regulating train operation, is to protect society from the effects attendant upon the occurrence of errors in such operations, and it is probable if all these laws were rigidly enforced, that some measure of additional safety might be realized in this direction. It is a fact, however, that the legislation now existing for the public safety, has had very little effect toward removing the most prolific cause of railway fatalities, viz., human fallibility; and, unless more effective means are devised whereby this weak point in our railway practice be eliminated, and this is susceptible of accomplishment, our efforts toward approximating perfect safety in railroad operation must impress the public as not having been earnestly or intelligently undertaken.

STATE LAWS.

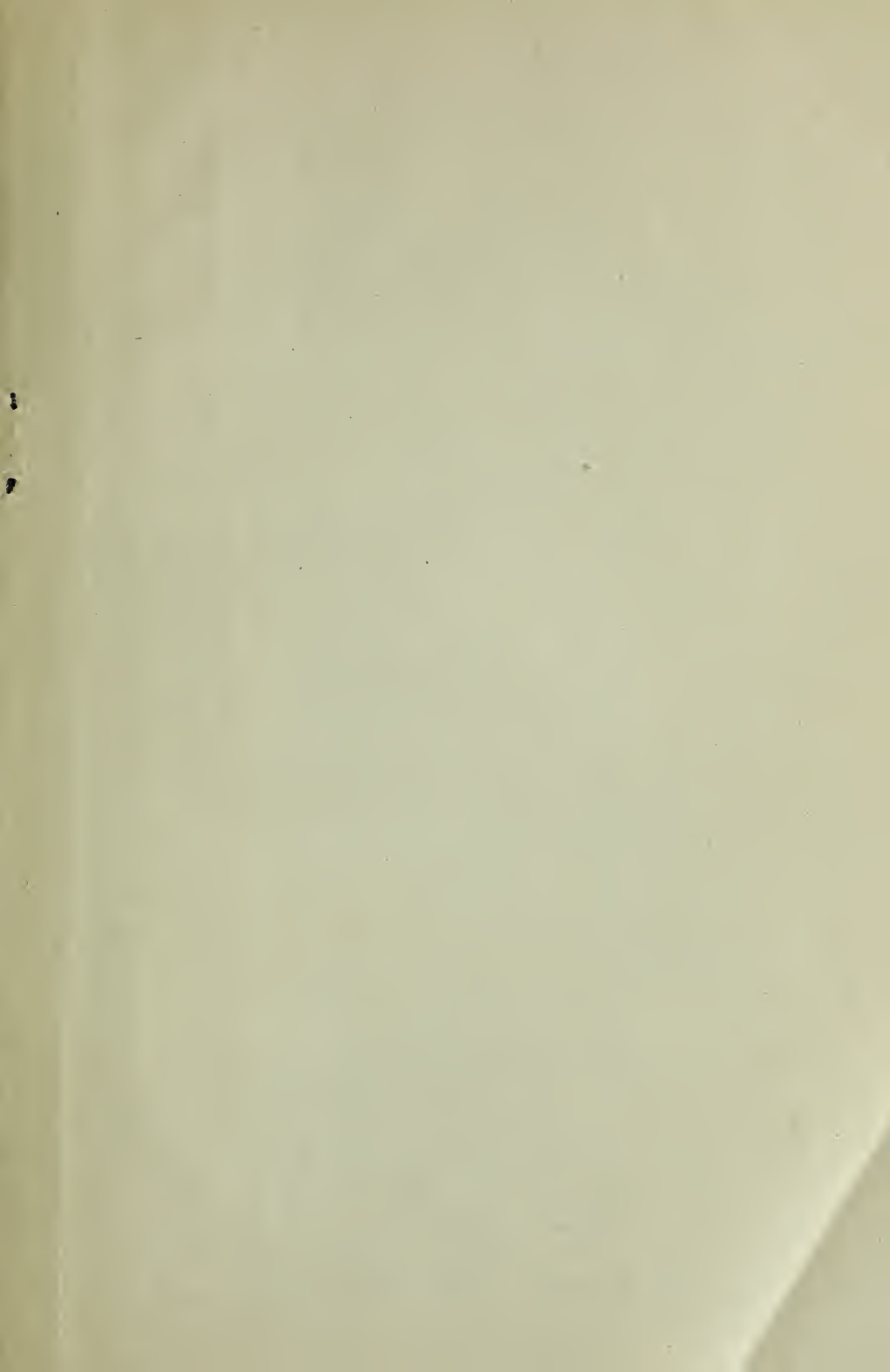
The lack of uniformity and the varying degrees to which state laws affecting railroad operation are enforced in the different states is very marked. The measure of safety which the public is demanding from errors in railroad operation cannot be expected to be realized without uniform and concerted action on the part of the different states whose duty it is to care for the public interests in this respect.

The advisability and fairness of some of the state laws now existing and affecting train operations are also open to question.

LAWS REGULATING RAILROAD OPERATION SHOULD BE UNIFORM AND FAIR.

Because of the confusion which now exists in the different state laws, it appears that both the interests of the public and the railway companies in the matter of safety from errors in railroad operation would be materially advanced if all legislation pertaining to railroad operation was made uniform insofar as the basic principles are concerned; and, necessarily, in the preparation of corrective measures of this character, the local or varying conditions, climatic or otherwise must be carefully studied and considered to the end that these rules and regulations when finally prepared, be expedient, fair and practical. Thus, it would appear that wonderful results may be accomplished for the welfare of society in this direction by the earnest co-operation of the different states.

Dated at St. Paul, Minn., October 23, 1912.





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